

Capacity Management (NEMA)

Help Prevent Business Disruption Due to Electrical Overload with Capacity Planning

EcoStruxure Power Digital Application

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EcoStruxure™ Power



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Overview

Context of Application

Many facilities are in a constant state of flux. Areas are being renovated, equipment is being moved, new production lines are brought online, and old equipment is being upgraded.

Capacity of the electrical distribution infrastructure has to evolve per these changing environments while not exceeding the rating of electrical distribution equipment.

This is a problem for circuit breakers, Uninterruptible Power Supplies (UPSs), generators, Automatic Transfer Switches / Power Transfer Switches (ATSs/PTSS), transformers, capacitor banks, busbars, conductors, fuses, etc. Often, exceeding the rated capacity means nuisance trips, but it can also result in overheating or fires.

Problem to Solve

The facility/energy manager needs to:

- Understand the capacity needs of the electrical distribution infrastructure to comply with energy standards and/or to plan for expansions or modifications of the facility.
- Upgrade the facility while not exceeding the rated capacity of equipment and while mitigating potential risks to the electrical infrastructure (for example, nuisance trips, overheating, fires).

Purpose of the Application

Visualize real-time or historical power system capacity

- Monitor real-time circuit loading
- Trend and report historical loading
- Pre-defined reporting for equipment Capacity Management (circuit breakers, UPSs, generators, ATSs/PTSS, transformers, capacitor banks, busbars, conductors, fuses, etc.)

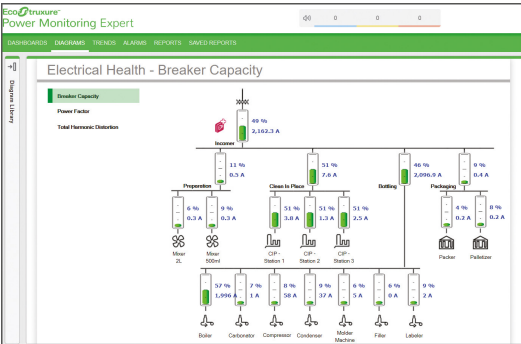
Provide information for capacity planning

- Simplify capacity planning for operations, expansion, or modifications
- Avoid oversubscribing critical equipment

Application Outcomes

Live Data Display

Capacity of electrical circuits can be visualized in an Electrical Health Diagram.



Electrical Health Diagram

Events and Alarms

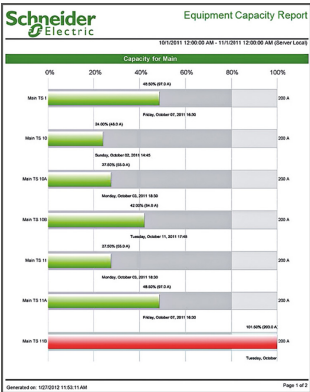
Smart alarms can be configured to alert energy managers or operations staff in case equipment capacity thresholds are exceeded.

Trends

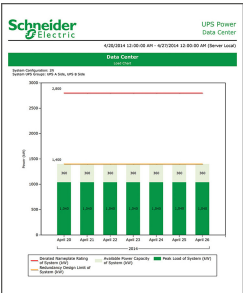
Real-time and historical data can be viewed on a trend viewer.

Reports

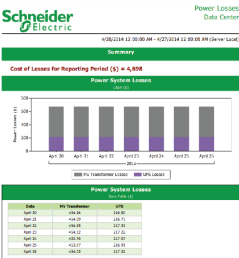
- Branch Circuit Power Report
- UPS Power Report
- Generator Capacity Report
- Generator Power Report
- Equipment Capacity Report
- Power Losses Report



Equipment Capacity Report



UPS Power Report



Power Losses Report

Notifications

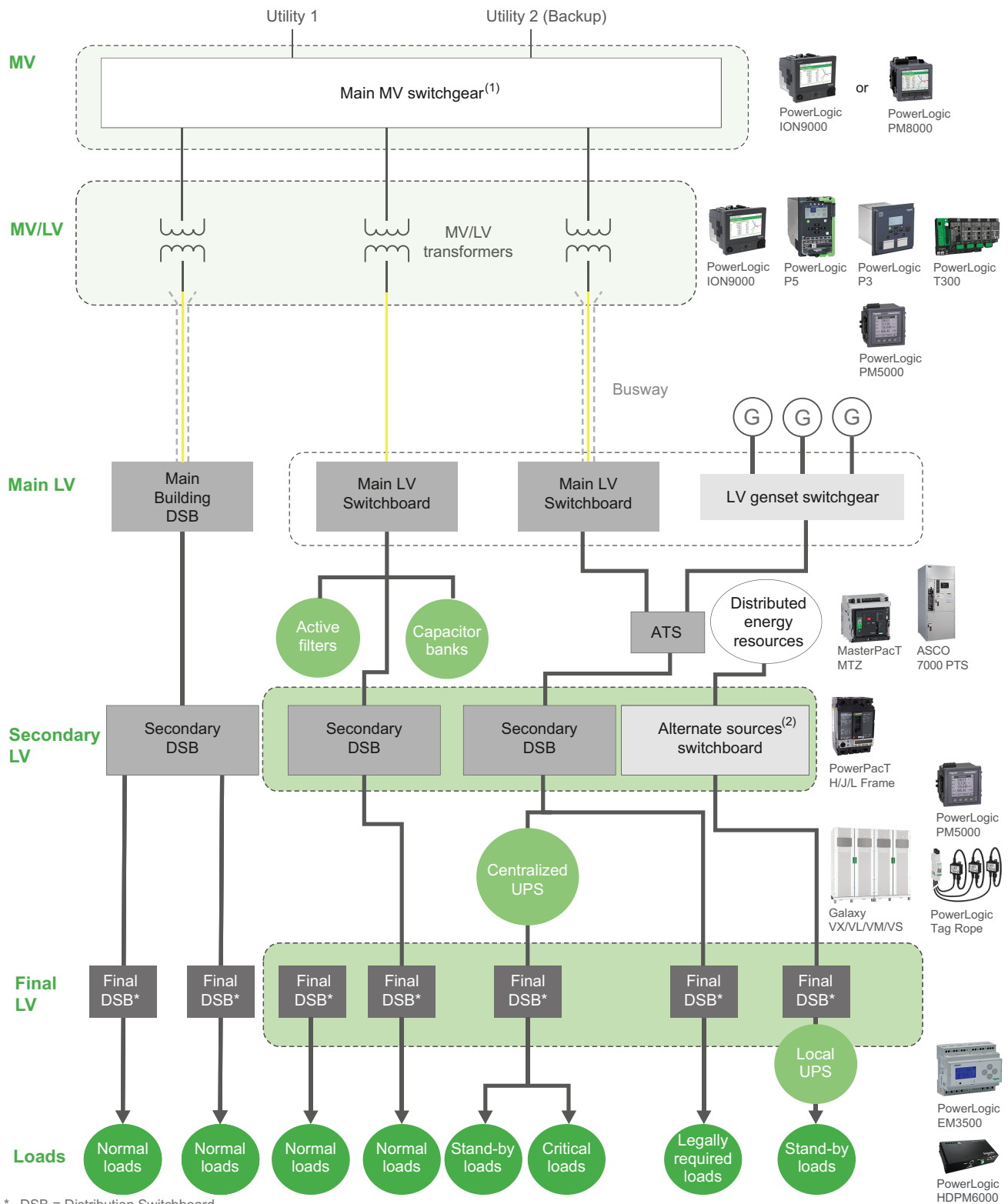
SMS or email notifications are sent on pre-alarm and alarm conditions to enable fast action.

Cloud-Based Analytics and Services

As an option, EcoStruxure Service Plan powered by EcoStruxure Power Advisor can perform analytics based on historical data to provide insights and decision support. Issues related to electrical capacity of critical equipment, such as transformers, are shared with the user by our Schneider Electric service experts on a periodic basis with recommended actions to resolve them.

Electrical Architecture

The following diagram details the areas of the architecture where the connected products should be installed in order to implement the Capacity Management application:

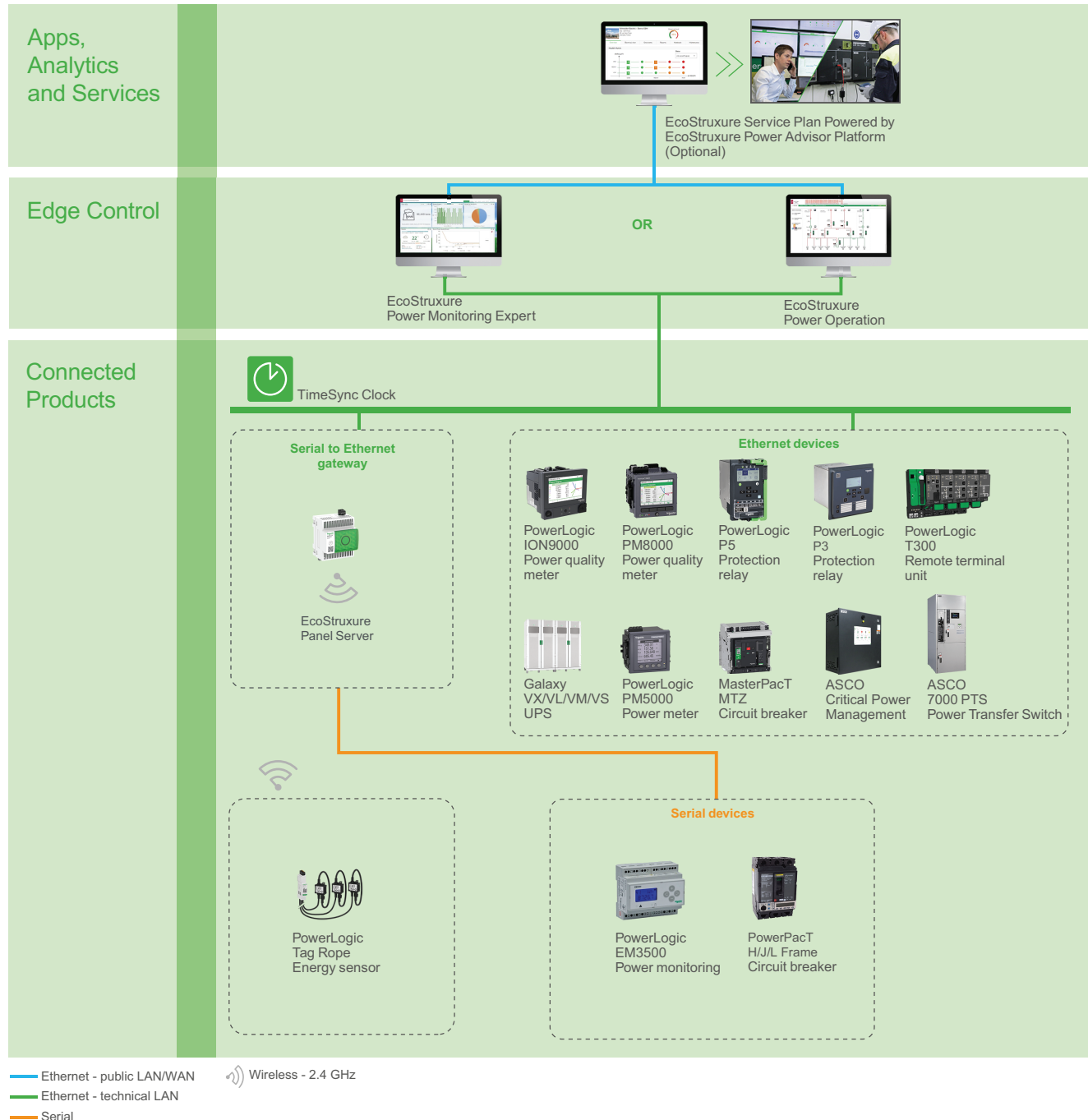


Digital Architecture

In this architecture, the data is collected from connected products either directly over Ethernet or via gateways (such as the EcoStruxure Panel Server). These data are then recorded and processed by the Edge Control software (EcoStruxure Power Monitoring Expert or Power Operation) for on-premise visualization, analysis, and reporting.

As an option, data from EcoStruxure Power Monitoring Expert or Power Operation can be passed on to the EcoStruxure Power Advisor platform and interpreted by experts as part of the EcoStruxure Service Plan.

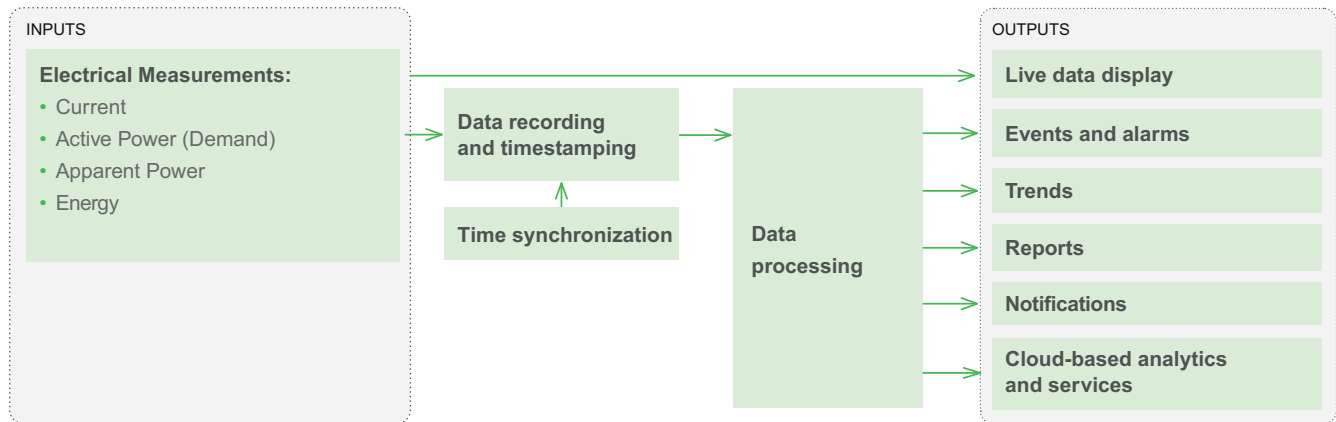
The recommended digital architecture for the application is shown below:



System Description

Data Flow

The Capacity Management application can be broken down as follows:



Inputs

The following data is required:

Electrical Measurements

The following electrical measurements are collected at strategic points of interest in the electrical distribution such as generators, Uninterruptible Power Supplies (UPSs), Automatic/Power Transfer Switches (ATSS/PTSS), feeders:

- Current (A)
- Active power (demand) (kW)
- Apparent power (kVA)
- Energy (kWh)

These data may be acquired from:

- **Power/energy meters** such as PowerLogic ION9000, PM8000, PM5000, HDPM6000, Tag Rope, EM3500



PowerLogic
ION9000



PowerLogic
PM8000



PowerLogic
PM5000



PowerLogic
HDPM6000



PowerLogic
Tag Rope



PowerLogic
EM3500

- **Devices with embedded metering** such as protection devices (PowerLogic P5/P3, MasterPacT MTZ, PowerPacT H/J/L), automation controllers (PowerLogic T300, ASCO 7000 Series PTS), and UPSs (Galaxy VX/VL/VM/VS)

PowerLogic
P5PowerLogic
P3MasterPacT
MTZPowerPacT
H/J/LPowerLogic
T300ASCO
7000 Series
PTSGalaxy
VX/VL/VM/VS

Data Recording and Timestamping

For the Capacity Management application, a timestamp accuracy of ± 1 second is sufficient for:

- Time-based historical data visualization
- Capturing peak power demand
- Comparing peaks between different circuits for proper capacity planning

Advanced power meters such as the PowerLogic ION9000, PM8000, HDPM6000 and some PowerLogic PM5000 models (PM53xx and PM55xx) can timestamp and record onboard energy measurements. EcoStruxure Power Monitoring Expert or Power Operation can then retrieve the records with their original timestamp.

PowerLogic
ION9000PowerLogic
PM8000PowerLogic
HDPM6000PowerLogic
PM5000

For other devices (PowerLogic P5/P3, MasterPacT MTZ, Galaxy VX/VL/VM/VS, PowerLogic T300, ASCO 7000 Series PTS, entry level PowerLogic PM5000 models, etc.) measurements are acquired by the connected products and then recorded and timestamped by EcoStruxure Power Monitoring Expert or Power Operation.

PowerLogic
P5PowerLogic
P3MasterPacT
MTZGalaxy
VX/VL/VM/VSPowerLogic
T300ASCO
7000 Series
PTSPowerLogic
PM5000EcoStruxure
Power Monitoring ExpertEcoStruxure
Power Operation

NOTE: For devices without onboard logging, there is a possibility of data loss in the event of a communication failure.

For a comprehensive overview of device recording and timestamping capabilities, refer to Data Recording and Time Synchronization Capabilities of EcoStruxure Power Connected Products.

Time Synchronization

For consistent timestamping of all the data, the date and time should be accurately distributed to connected products and data loggers.

Time synchronization can be performed through various technologies (PTP, NTP, SNTP, etc.). An external master clock may be required and can be connected to a GPS antenna to reach the expected time precision.



TimeSync Clock

Data Processing

Capacity Management data processing is embedded in the optional Capacity Management module of EcoStruxure Power Monitoring Expert or Power Operation.

EcoStruxure
Power Monitoring ExpertEcoStruxure
Power Operation

Load Analysis

For branch circuits within a data center facility, average and maximum loading are tracked and compared to the circuit breaker size (A) to validate the design or to alert about potential overloading.

For an Automatic/Power Transfer Switch (ATS/PTS) or other equipment, peak load is compared with the rated capacity of the equipment to alert about potential overloading.

Power Capacity Analysis

For generators or UPSs, all related loads are compared with the remaining capacity to validate that a utility power outage could be handled while still complying with the intended redundancy design.

Power Loss Calculation

For transformers or UPSs, measurements performed at primary and secondary connections (in and out) are compared to establish power loss and associated cost.

Aggregation of Power for Electrical Code Compliance

Apparent power (kVA) is aggregated for total lighting loads according to NEC 220.12.

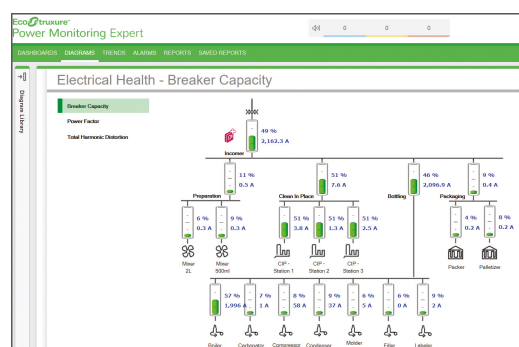
Outputs

Outputs are displayed by the Edge Control software (EcoStruxure Power Monitoring Expert or Power Operation).

Live Data Display

The following visualizations can be configured:

- Live graphic pages to show actual loading compared to nameplate rating or designed capacity (Capacity Management diagram)
- Live data tables with current and demand power values for selected devices



Capacity Management Diagram

Events and Alarms

Smart alarms can be configured to alert energy managers or operations staff in case of exceeded equipment capacity thresholds or in accordance with relevant electrical codes (for example, NEC 220.12).

Trends

Historical and real-time electrical and other measured data can be displayed as trends in Edge Control software.

Multiple measurements from selected devices can be viewed with dynamic scaling on a configurable time range.

Additionally, target lines can be applied to trended data. Trended data can also be exported in .CSV format.

Reports

The Capacity Management module of EcoStruxure Power Monitoring Expert or Power Operation must be deployed to benefit from the following reports:

Branch Circuit Power Report

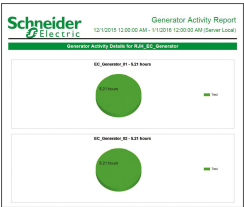
Monitors the capacity of branch circuits. Use this report to analyze IT branch circuit power loading and to understand remaining capacity at the branch circuit level (primarily for data center applications). Specific measurements required are Active Power (kW) and Current (A).

Customer	Rack	Branch Circuit	Status	Active Power (kW)	Reactive Power (kVAr)	Complex Power (kVA)	Current (A)	Temperature (°C)	Humidity (%)
Customer 1	Rack 01	Branch Circuit 01	OK	10.5	2.4	11.3	2.5	40	45
		Branch Circuit 02	OK	10.5	2.4	11.3	2.5	40	45
Customer 1	Rack 01	Branch Circuit 03	OK	10.5	2.4	11.3	2.5	40	45
		Branch Circuit 04	OK	10.5	2.4	11.3	2.5	40	45
Customer 1	Rack 01	Branch Circuit 05	OK	10.5	2.4	11.3	2.5	40	45
		Branch Circuit 06	OK	10.5	2.4	11.3	2.5	40	45
Customer 1	Rack 01	Branch Circuit 07	OK	10.5	2.4	11.3	2.5	40	45
		Branch Circuit 08	OK	10.5	2.4	11.3	2.5	40	45
Customer 1	Rack 01	Branch Circuit 09	OK	10.5	2.4	11.3	2.5	40	45
		Branch Circuit 10	OK	10.5	2.4	11.3	2.5	40	45

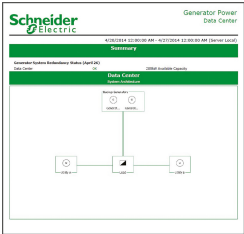
Branch Circuit Power Report

Generator Power Report

Provides information regarding the generator backup power system and its ability to handle a utility power outage while still complying with the intended redundancy design. Specific measurements required are Active Power (kW).

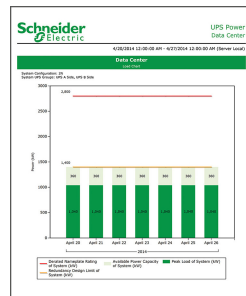


Generator Power Report

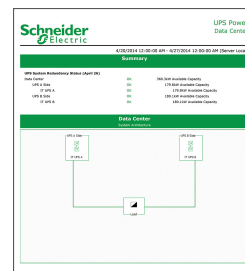


UPS Power Report

Provides information regarding the UPS backup power system and its ability to handle a utility power outage while still complying with the intended redundancy design. Specific measurements required are Active Power (kW).



UPS Power Report

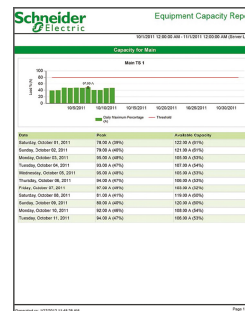


Equipment Capacity Report

Shows the peak load of any circuit breaker, cable, busbar, ATS/PTS, etc. with respect to its rated capacity. Specific measurements required are Active Power (kW), Apparent Power (kVA), or Current (A).

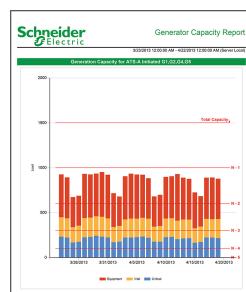


Equipment Capacity Report



Generator Capacity Report

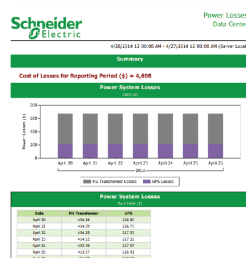
Helps verify that the generators can adequately support the loads required during a utility outage. Specific measurements required are Active Power (kW) or Apparent Power (kVA).



Generator Capacity Report

Power Losses Report

The Power Losses Report shows losses (kW and cost) in transformers and UPS systems. The cost calculations are based on a configurable flat-rate energy cost. Use this report to analyze and quantify the power losses in your transformer and UPS networks.



Power Losses Report

Notifications¹

SMS or email notifications are sent on pre-alarm and alarm conditions to enable fast action.

Cloud-Based Analytics and Services

As an option, EcoStruxure Service Plan powered by EcoStruxure Power Advisor provides electrical network and alarm health analytics with recommendations from our Schneider Electric service experts.

Issues and recommendations are shared with the user on a periodic basis. These analytics and recommendations:

- Identify patterns and recommend actions to remove, repair, or resolve alarms.
- Analyze and recommend actions to mitigate transformer overloading.
- Identify excessive voltage and current harmonics and recommend mitigation.
- Measure and recommend improvements of poor power factor.



EcoStruxure Service Plan Powered by
EcoStruxure Power Advisor

1. For notifications in EcoStruxure Power Monitoring Expert and Power Operation, the Event Notification Module is required.

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